

New Holland Mouse *Pseudomys novaehollandiae* (Rodentia: Muridae) in South Gippsland, Southern Victoria Part One - Distribution and Status

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Abstract

Results of a survey for New Holland Mouse *Pseudomys novaehollandiae* populations in areas of South Gippsland, conducted by the then Department of Conservation and Natural Resources (currently Department of Natural Resources and Environment) in 1992-1993 are outlined. The survey employed trapping, hair-tubing and the collection of predator scats to determine the distribution of this species. Two previously unknown populations of New Holland Mouse totalling 15 individuals were located in vegetated sand dunes on the Yanakie Isthmus, Wilsons Promontory National Park. However, populations which were previously known from the Promontory and McLoughlins Beach (Nooramunga Marine and Coastal Park) are believed to be no longer present. The species was not detected at two further areas formerly known to support it, Dream/ Hummock Island and Mullungdung State Forest. Thus, the Wilsons Promontory populations currently represent the only populations of New Holland Mice known from South Gippsland where the species' range is in decline. Management issues for the New Holland Mouse in South Gippsland will be the subject of a follow-up paper. Distribution and habitat of other small ground mammals are noted. Generally, these species occurred in habitats similar to those found in previous studies. (*The Victorian Naturalist* 1996, 113, 236-246).

Introduction

The New Holland Mouse *Pseudomys novaehollandiae* (family Muridae) is a small native rodent with a limited distribution in south-eastern Australia, occurring on coastal and hinterland areas of central eastern New South Wales, central southern Victoria and north-eastern Tasmania (Kemper 1995) (Fig. 1).

The New Holland Mouse is classified as endangered in Victoria (CNR 1995). The species which has been listed under the *Flora and Fauna Guarantee Act* 1988 is rare, in decline and subject to a number of potentially threatening processes (Menkhorst 1995; Seebeck *et al.* in prep.).

Various studies provide descriptions and analyses of New Holland Mouse habitats (e.g. Keith and Calaby 1968; Fox and Fox 1978; Cockburn 1980; Wilson 1991). Typical habitats are coastal heathland or woodland and open forest with a heathy understorey on sandy substrate. Species of the following genera are commonly recorded at such sites: *Acacia*, *Banksia*, *Leptospermum*, *Dillwynia*, *Xanthorrhoea*, *Epacris*, *Hibbertia* and *Allocasuarina*; in

addition to sedges (Cyperaceae, Restionaceae). Less typically this rodent occupies swamp edges (Keith and Calaby 1968) and vegetated sand dunes (Peter Menkhorst *pers. comm.*).

The New Holland Mouse prefers a heath understorey actively regenerating after disturbance from fire, vegetation clearing, sand-mining or grazing (refer above studies). This preference appears to relate to high vegetation cover close to ground level (Posamentier and Recher 1974; Fox and Fox 1978; Wilson 1991), high species diversity in the understorey (Fox and Fox 1978; Cockburn 1980), and a high abundance of Leguminosae species in the understorey (Keith and Calaby 1968; Posamentier and Recher 1974; Braithwaite and Gullan 1978).



Fig. 1. New Holland Mouse *Pseudomys novaehollandiae*

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The aims of this study were to establish the distribution of New Holland Mice in the South Gippsland District, to determine habitat indicators, to identify important management issues and to formulate a long-term monitoring program.

Study Sites, Materials and Methods

Mullungdung and Won Wron State Forests

New Holland Mice were captured at two sites in Mullungdung State Forest in 1975 (Gilmore 1977). In the same general vicinity, a survey in 1992 by staff from Deakin University trapped what was believed to be one New Holland Mouse. The vegetation at this latter site was used as a guide for selecting other sites in Mullungdung. However, since the survey outlined in this paper was undertaken, doubts concerning the identity of the 1992 Deakin specimen have arisen (Barbara Wilson *pers. comm.*).

Eighteen sites were chosen after examining a Land Conservation Council vegetation map (LCC 1980), corresponding aerial photographs and ground checking. These sites were covered in four separate trapping sessions, each session covering four

nights. At each site 14, 15 or 30 Elliott traps were located, generally in two or three straight line transects with 20 m intervals between traps and lines. The total number of trapnights (number of traps x number of nights that traps were open) is shown in Table 1. Locations of sites are illustrated in Fig. 2(Bait was a mixture of peanut butter, honey, rolled oats, vanilla and/or almond essence. Traps were checked in the first few hours of daylight and the animal captures recorded. Animal captures were individually marked in one of two ways: with a small nick in one of the ears, or a non-toxic black pen mark on one of their hind feet or tail. Traps were kept closed during the day and re-opened in the last two hours before sunset.

Small hair tubes comprising a 30 mm diameter conduit design, modified from Suckling (1978), were placed at each trap station of the first ten sites for eight days inclusive (dates are shown in Table 2). Tubes were baited with the same mixture as used in the Elliott traps. Hairs collected by this technique were forwarded to Raelene Warren (Deakin University,

Table 1. Mammal species detected by Elliott trapping at study locations in South Gippsland.

1 = No. of Sites; 2 = No. of Trapnights; 3 = Sampling Period ; 4 = Species Captured; 5 = Total No. of Captures; TOTAL = Total No. of Captures (No. of individuals). (Note : site specific data is provided CNR (1993) and Quin (1994). Cage trapping was also employed at Wilsons Promontory and totalled 38 trapnights).

Location	1	2	3	4	5	6
Mullungdung State Forest	18	1253	19/11/92-04/04/93	Brown Antechinus	43	(35)
				Eastern Pygmy-possum	8	(6)
				Bush Rat	26	(13)
				Swamp Rat	7	(4)
				Black Rat	7	(5)
TOTAL				91	(63)	
Won Wron State Forest	5	296	19/12/92-23/12/92	Brown Antechinus	13	(8)
				Bush Rat	1	(1)
				Black Rat	2	(1)
				House Mouse	1	(1)
TOTAL				17	(11)	
Dream/Hummock Island	4	190	25/03/93 - 27/03/93	Swamp Rat	35	(29)
				House Mouse	33	(33)
TOTAL				68	(62)	
Wilson's Promontory National Park (Yanakie Isthmus)	6	562	15/02/93 - 24/04/93	Bush Rat	23	(15)
				Swamp Rat	10	(4)
				House Mouse	11	(11)
				New Holland Mouse	30	(15)
TOTAL				74	(45)	

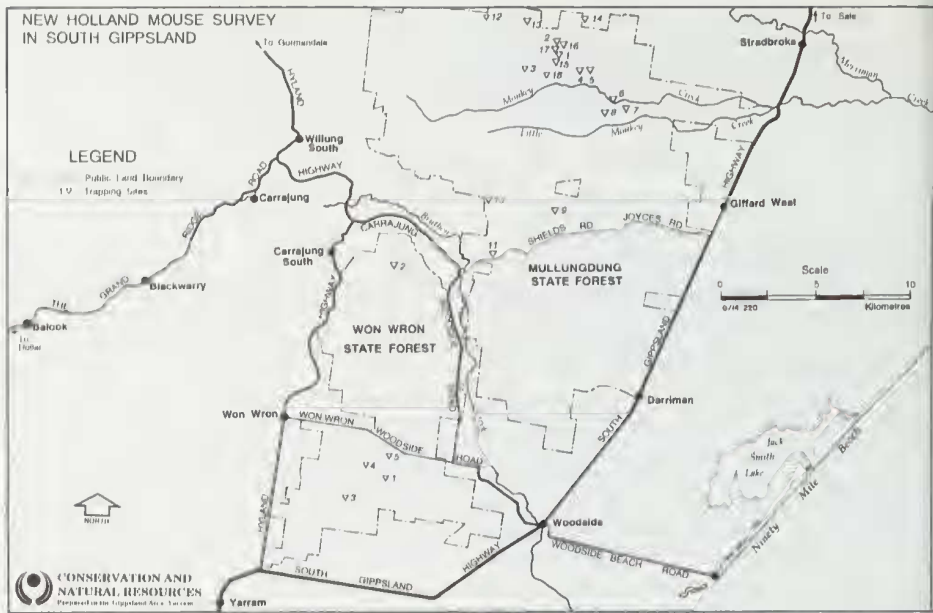


Fig. 2. Location of trap and hair tube sites in Mullungdung and Won Wron State Forests.

Table 2. Mammal species detected by hair-tubing at study locations in South Gippsland. 1 = No. of sites; 2 = No. of Hair Tubes; 3 = Sampling Period; 4 = Species Detected (Note : site-specific data is provided in CNR (1993) and Quin (1994). Two of the four sites hair-tubed at Wilsons Promontory were additional to those trapped at that location).

Location	1	2	3	4
Mullungdung State Forest	10	148 small tubes	21/11/92 to 17/12/92	Brown Antechinus Unidentified Antechinus Bush Rat Unidentified Rat
Won Wron State Forest	1	2 small tubes	27/11/92 to 05/12/92	Unidentified Antechinus
Wilson's Promontory National Park (Yanakie Isthmus)	4	22 small tubes/ 20 large tubes	18/02/93 to 28/04/93	Unidentified Antechinus Bush Rat Unidentified Rat Black Wallaby Common Wombat <i>Vombatus ursinus</i>

Geelong) and Barbara Triggs ('Dead Finish', Genoa) for identification using the technique developed by Brunner and Coman (1974).

Small hair tubes were set with the Elliott traps to establish whether hair tubes would be suitable for detecting the New Holland Mouse. However, despite traps and tubes failing to detect New Holland Mice in Mullungdung State Forest, both techniques were employed elsewhere. The hair-tubing proved to be a useful secondary device for

confirmation of trapping results.

New Holland Mice have never been recorded from Won Wron State Forest. However, this area occurs within close proximity to Mullungdung State Forest and supports large areas of heathland. For these reasons, five sites were established in Won Wron State Forest and sampled following principles already outlined (refer Figure 2; Tables 1 and 2.).

Predator scats were collected during concerted searches and opportunistically along

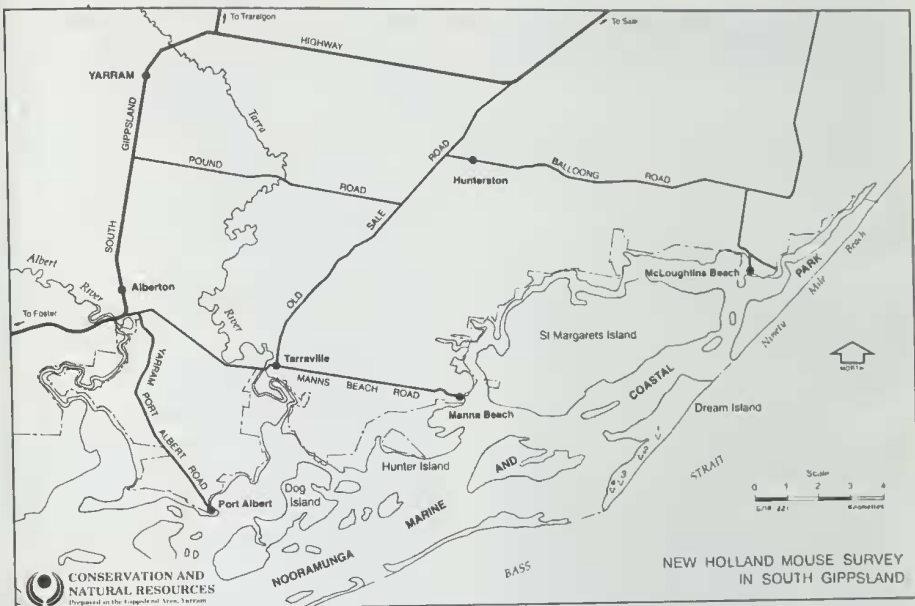


Fig. 3. Location of trap sites on Dream/Hummock Island, Nooramunga Marine and Coastal Park.

roads and narrow trail-bike tracks at sites. They were forwarded to Barbara Triggs for analysis.

Dream/Hummock Island

New Holland Mice were captured at the south-west point of this island in 1977 (Menkhorst 1995; Peter Menkhorst *pers. comm.*). Vegetation recorded at this site was used as a guide for selecting trapping locations for the 1992-1993 survey. General procedures employed in Mullungdung and Won Wron State Forests were followed on Dream/Hummock Island (refer Table 1), however, no hair-tubing was used. The fourth site (a camp area) was established on the final night following several chance observations of small rodents the previous night. However, only five traps were used at this site. No predator scats were located on the Island. Refer Figure 3 for trapping locations.

Wilson's Promontory National Park

New Holland Mice had been detected twice on the Promontory, in 1973 and 1975 (Mammal Survey Group of Victoria records). In February 1993, a previously unrecorded population was located on the Yanakie Isthmus of the Promontory during a separate trapping program. Some results of that survey are reproduced here from

the corresponding report (refer CNR 1993).

The general design, material and methods used in the survey at Wilson's Promontory in February 1993 are provided in Quin (1994). However, three further sites were specifically targeted for New Holland Mice. Two were trapped and one was sampled by hair-tubing and further details are provided in Tables 1 - 3. Procedures for these three sites were similar to those described for Mullungdung State Forest and in CNR (1993). Large hair tubes similar to the design described by Scotts and Craig (1988) were also employed at the Promontory.

In April 1993, two sites sampled in the February survey were re-trapped (Tables 1 - 3) including the site where New Holland Mice were located. The vegetation at the most recently located site was used as a guide for selecting two further areas which were surveyed in April 1993 for New Holland Mice. Trapping transects were either straight or bent line, with 10 m spacing between traps (and lines where applicable). Other procedures were as outlined previously. Fig. 4 illustrates sites sampled for New Holland Mice on the Promontory.

Table 3. Mammal species detected by analysis of hair or predator scats collected from study locations in South Gippsland.

1 = No. of Sites; 2 = Sampling Period; 3 = Species Detected.

Location	1	2	3
Mullungdung State Forest	8	09/12/92 to 21/12/92	Brown Antechinus Swamp Rat Common Ringtail Possum Unidentified Brushtail Possum Black Wallaby Eastern Grey Kangaroo <i>Macropus giganteus</i> Cat <i>Felis catus</i> (feral)
Wilsons Promontory National Park (Yanakielsthmus)	1	24/04/93 to 26/04/93	Bush Rat Black Wallaby Common Wombat European Cattle <i>Bos taurus</i> (feral)

Animal Handling

A suite of morphological measurements was taken from captured New Holland Mice (refer Quin 1994). Additionally, Dr Barbara Wilson of Deakin University had requested that scats (dietary analyses) and hair samples (for genetic studies) from New Holland Mice be collected, to assist in formulating management recommendations for this species in South Gippsland and across its Victorian range. Scats and hair samples were collected from all individuals trapped and have been forwarded to Deakin University researchers. Invertebrates taken from the fur of some individuals were forwarded to the Museum of Victoria for identification.

Individuals of other species trapped were handled for identification purposes only, with the exception of Eastern Pygmy-possums *Cercartetus nanus*. This species can be difficult to detect and captured individuals represent a good opportunity to learn more about the species. Consequently, morphometrics were taken from Eastern Pygmy-possums captured in the present study.

Vegetation

The overall vegetation form at each site, in which traps or hair-tubes were set, was assessed and crudely classified into one of seven habitat types, largely based on understorey species composition, but also structural attributes. The habitats were: wet heathland, dry heathland, heathy woodland, heath-bracken woodland, rehabilitated gravel scrape vegetation, heathy open

forest and coastal sand dune vegetation. Character species for each habitat are provided in Table 4. Time did not permit a more comprehensive analysis of habitat types at trap sites (with exceptions indicated below). The crude classification served to indicate broad habitats in which trapping occurred, and the major habitat type present at sites.

At Sites 1-3, 14, 16-18 in Mullungdung State Forest, a list of plants was compiled and each given a cover value according to the Braun-Blanquet scale (Mueller-Dombois and Ellenberg 1974). At Site 1 in Wilsons Promontory National Park, a full list of plant species was produced, however, cover values were not given. (Note: these lists are not included in the paper).

Particular note was made of the age of vegetation after fire when selecting study sites, due to the preference of New Holland Mice for an actively regenerating heath.

However, many sites surveyed did not support young vegetation for the following reasons: trapping of sites known to contain New Holland Mice in the past often meant trapping in relatively old vegetation; most of the Mullungdung sites surveyed were selected on the basis of their similar fire histories and plant composition to that of the most recent (unconfirmed) record of New Holland Mice in that forest (i.e. 11-year-old heath); much of the heathland vegetation in Mullungdung is ten years of age or older; the initial survey at Yanakielsthmus (CNR 1993) discovered New Holland Mice can exist in relatively old

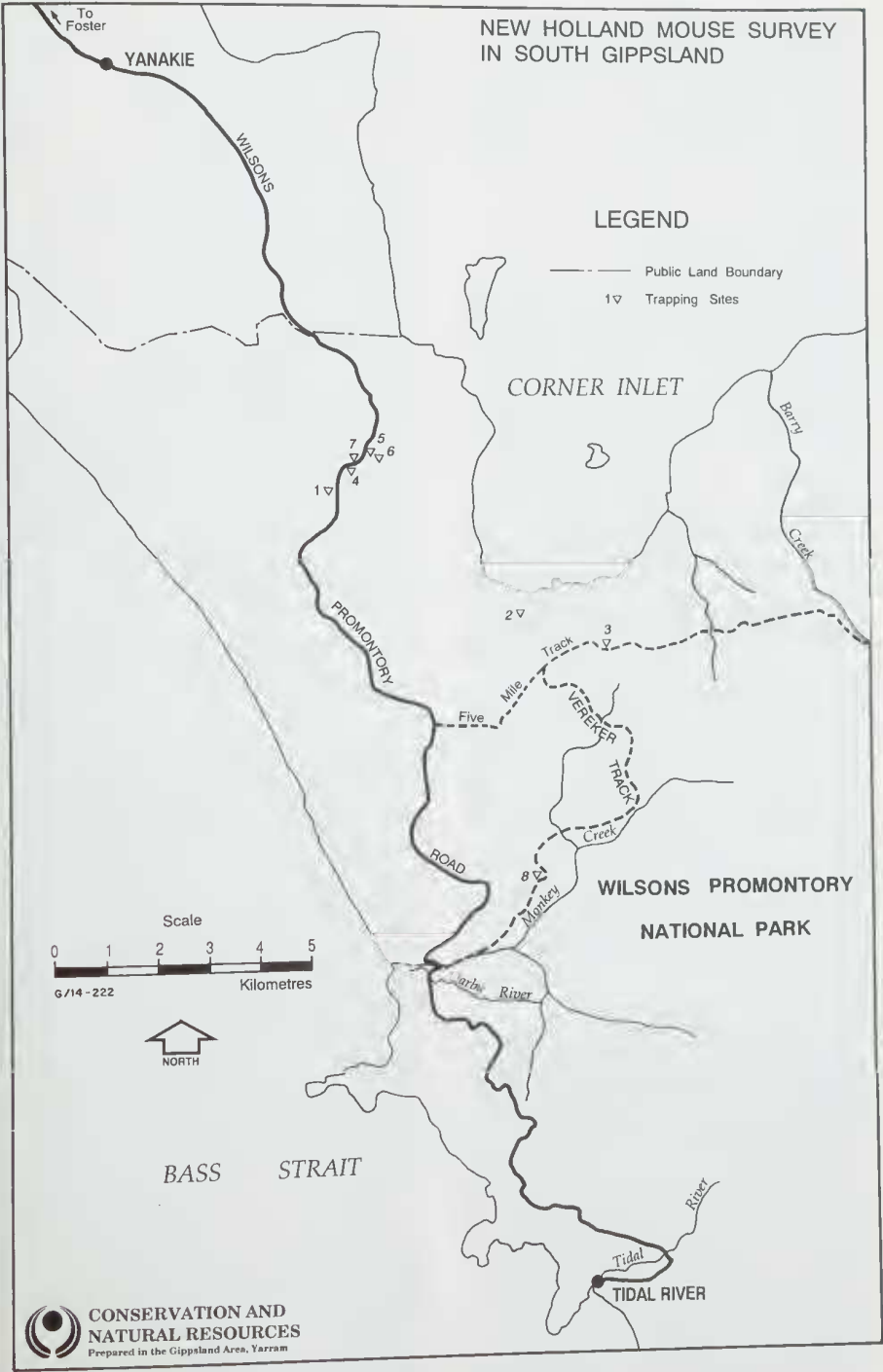


Fig. 4. Location of trap and hair tube sites on Wilsons Promontory

vegetation growing on sand dunes. Vegetation ages were obtained from fire history maps kept in the Yarram Natural Resources and Environment office. Those for the Yanakie Isthmus were obtained from Jim Whelan (*pers. comm.*). All vegetation ages are given in Table 4.

Results

Mullungdung State Forest

Trapping at 18 sites in Mullungdung State Forest yielded 91 captures of 63 individuals (five species) from 1253 trapnights (7.3%), a low capture rate. The species most commonly trapped, Brown Antechinus *Antechinus stuartii*, occurred at most sites and habitat types. A notable species captured was Eastern Pygmy-possum. Three individuals (one male, two females) were located at two separate sites in heathy woodland and rehabilitated gravel scrape vegetation (heath). Swamp Rats *Rattus lutreolus* were caught only at the wet heathland site. New Holland Mouse was not trapped. Refer Table 1 (trapping data), Table 4 (vegetation). Additional information is contained in Quin (1994).

Hair-tubing did not detect species additional to those trapped (at the first 10 sites). For this reason, it was decided not to hair-tube Sites 11 - 18 and to concentrate on the trapping (Table 2). Predator seats analysed for the contents also failed to detect New Holland Mice. Remains of Swamp Wallaby *Wallabia bicolor* and Common Ringtail Possum *Pseudocheirus peregrinus* were common in predator seats (Table 3).

Won Wron State Forest

Low capture rates also characterised the trapping conducted in Won Wron State Forest; 17 captures of 11 individuals (four species) from 296 trapnights, a 5.7% success rate (Table 1). Brown Antechinus were captured at three sites (heathy woodland and heathy open forest), but not the two 'young' (0.8 years) heathy woodland sites; a single House Mouse *Mus musculus* was caught at one of the latter sites (Tables 1 and 4).

Dream/Hummock Island

Trapping rates at Dream/Hummock Island were relatively high, 35.8%, consti-

tuting 68 captures of 62 individuals from 190 trapnights. These trappings comprised approximately equal numbers of Swamp Rats and House Mice, when data from four sites were combined (Table 1). However, Swamp Rat captures were much higher at Sites 1 and 3, and the reverse applied for Site 2; Site 4 trapnights totalled only five and six House Mice were caught. All captured animals were judged as adult status (Quin 1994), though considerable size variation occurred with the Swamp Rats.

Wilsons Promontory National Park

Summary - Trapping Results

Trapping at Wilsons Promontory National Park detected four small mammal species, including the New Holland Mouse (Table 1). The overall trapping rate was 13.2%, comprising 74 captures of 45 individuals from 562 trapnights. New Holland Mice comprised the highest number of captures - 30 captures of 15 individuals from two sites (Quin 1994).

New Holland Mouse - Trapping Results

New Holland Mice were trapped at Sites 1 and 5 (see Fig. 4). The New Holland Mouse captures at Site 1 constituted seven males and three females in the February 1993 survey. The seven males included two 'sub-adults' (both weighing approximately 13 g); the three females included a pregnant individual (24 g, the heaviest individual). In April 1993, six New Holland Mice (4 males, 2 females) were captured at this site, comprising four re-traps from February and two additional individuals (1 male, 1 female). Thus, the two surveys captured 12 New Holland Mice (8 males, 4 females) at Site 1. Only three male New Holland Mice were caught at Site 5, including the lightest individual (15 g) captured in April (sites combined). Tail lengths ranged from approximately 85-98 mm for adult males, and 83-100 mm for adult females. Pes (hind foot) length ranges were similar for the sexes, ranging from about 16 to 17 mm for adult individuals. Refer Quin (1994) for other measurements and details of New Holland Mice located.

Some limited observations made on New Holland Mice movements during the current survey are noteworthy. Upon release,

the majority of New Holland Mice moved toward the closest dense vegetation to make their escape. However, some jumped on to fallen, dead shrubs and used horizontal branches as pathways before leaping into dense ground vegetation.

New Holland Mice were generally re-trapped in close vicinity to their initial captive site. However, one individual was re-trapped the following night approximately 90 m from where it was first seized.

Three types of invertebrates were detected on New Holland Mice fur at Wilsons Promontory. They were :

1. flea, *Pygiopsylla* sp. (Family Pygiopsyllidae, Order Siphonoptera);
2. mite, *Dermanyssus* sp. or *Liponyssus* sp. (Family Dermanyssidae, Order Acarina);
3. beetle, *Myotyphlus* sp. (Family Staphylinidae, Order Coleoptera).

The mites were observed most commonly in fur surrounding the eyes of New Holland Mice. The fleas and beetles appeared to inhabit longer body fur on both dorsal and ventral surfaces of the mice.

New Holland Mouse - Habitat Descriptions

The habitat at Site 1 (a New Holland Mouse site) is described in Table 4, CNR (1993) and Quin (1994). It comprised of a calcareous dune system. Drooping Sheoak *Allocasuarina stricta*, Coastal Wattle *Acacia sophorae* and Coast Tea-tree *Leptospermum laevigatum* formed the overstorey. Black-anther Flax-lily *Dianella revoluta*, Spiny-headed Mat-rush *Lomandra longifolia* and Honey-pots *Acrotriche serrulata* dominated the understorey. The understorey cover was high in places; however, patches of fallen dead shrubs, litter and bare sand were obvious too.

New Holland Mice were also located at Site 5. The dune structure and vegetation at this site were similar to that at Site 1 (Table 4; Quin 1994). The vegetation was Saw Banksia *Banksia serrata*/*Allocasuarina stricta* open woodland with a sedge-dominated understorey. *L. longifolia* dominated the understorey of dunes, though patches of shrubs - an unidentified Guinea-flower *Hibbertia* species and

Coast Pomaderris *Pomaderris oraria* - were prominent, in particular, on higher dune points. *L. laevigatum* and *A. sophorae* had invaded the area forming thickets in places. However, the overall structure of the vegetation was more open than at Site 1.

The vegetation at Sites 4, 6 and 7 was similar in species composition to that at the New Holland Mouse sites. However, patches of dense *L. laevigatum* were more extensive, giving the sites a more closed structure, with less open sedge-dominated or sandy areas. At Site 8, the sand dune had been extensively invaded by *L. laevigatum*. The dense thicket/scrub vegetation had very little understorey vegetation at ground level (Quin 1994).

Other species - Trapping and Habitat

Three species additional to New Holland Mouse were trapped at Wilsons Promontory (Table 1). Bush Rats *Rattus fuscipes* (with one exception of an individual caught in wet heathland adjacent to heathy woodland at Site 2) and House Mice were trapped only in sand dune vegetation; Swamp Rats were caught only in the wet heathland Site 2. Bush Rats were captured at three of the dune systems where trapping occurred and House Mice at all dune sites sampled. No small ground mammals were caught in dry heathland.

Hair Tube Results

Hair-tubing detected four mammal species from three different sites (Table 2). At Site 1, where New Holland Mice exist, only Bush Rats were discovered by hair tubes. At Site 4, three different mammal species were detected, including an unidentified species of Antechinus, probably Brown Antechinus, a species not detected at any other Wilsons Promontory site. At Site 8, hair tubes failed to detect any species.

Discussion

New Holland Mouse - Overall Distribution in South Gippsland

New Holland Mouse is known in South Gippsland only from Wilsons Promontory National Park (Quin 1994). Populations were detected inhabiting sand dune vegetation at two previously unknown sites on the Yanakie Isthmus of the Promontory in

Table 4. Vegetation attributes at sites sampled for New Holland Mice in each study area. * = Fire history taken from written records, but on-site evidence of a much more recent burn apparent. Key: 1 = vegetation type; 2 = vegetation age (years); 3 = major character species

Area / Sites	1	2	3
Mullungdung State Forest			
1-8, 10, 12, 15, 16	heathy woodland	10-11	<i>Eucalyptus radiata</i> , <i>Banksia serrata</i> , <i>B. marginata</i> , <i>Acacia oxycedrus</i> , <i>Leptospermum continentale</i> , <i>L. myrsinoides</i> , <i>Bossiaea cinerea</i> , <i>Dillwynia glabberima</i> , <i>Epacris impressa</i> , <i>Gahnia radula</i> , <i>Hypolaena astigiata</i> , <i>Lomandra filiformis</i> , <i>L. glauca</i> , <i>Pteridium esculentum</i>
9, 13, 17	heath-bracken woodland	6, 9, 11	Generally as for heathy woodland but <i>P. esculentum</i> much more abundant
11	rehabilitated gravel-scrape vegetation (heath)	6	<i>Eucalyptus obliqua</i> , <i>E. muelleriana</i> , <i>L. continentale</i> , <i>L. myrsinoides</i> , <i>P. esculentum</i> , Poaceae spp.
14	heathy woodland	8	<i>Eucalyptus cephalocarpa</i> , <i>E. radiata</i> , <i>B. marginata</i> , <i>L. continentale</i> , <i>L. myrsinoides</i> , <i>E. impressa</i> , <i>Monotoca scoparia</i> , <i>Selaginella uliginosa</i> , <i>Amperea xiphoclada</i>
18	wet heathland	11	<i>Eucalyptus</i> spp., <i>Melaleuca squarrosa</i> , <i>L. continentale</i> , <i>Cyperaceae</i> spp.
Won Wron State Forest			
1, 3	heathy woodland	0.8	<i>Eucalyptus</i> spp., <i>B. serrata</i> , <i>Xanthorrhoea australis</i> , <i>P. esculentum</i> , <i>Acacia</i> spp.
2	heathy woodland	>50	<i>Eucalyptus nitida</i> , <i>B. serrata</i> , <i>X. australis</i> , <i>L. continentale</i> , <i>L. myrsinoides</i> , <i>B. cinerea</i> , <i>Eucalyptus</i> sp., <i>Spyridium parvifolium</i> , <i>B. marginata</i> , <i>Gonocarpus</i> sp., <i>Gahnia radula</i>
4, 5	heathy open forest	>50*	
Dream/Hummoek Island			
1-4	coastal sand dune vegetation	>50	<i>Acacia sophorae</i> , <i>Leptospermum</i> sp., <i>Myoporum insulare</i> , <i>Banksia integrifolia</i> , <i>Lepidosperma</i> sp., <i>Ammophila arenaria</i> , <i>Asteraceae</i> sp.
Wilson's Promontory National Park			
1,4-8	coastal sand dune vegetation	20-30	<i>A. sophorae</i> , <i>Allocasuarina stricta</i> , <i>L. laevigatum</i> , <i>Dianella revoluta</i> , <i>Lomandra longifolia</i> , <i>Acrotiche serrulata</i> , <i>Bursaria spinosa</i> , <i>Pomaderris oraria</i>
	wet heathland	4	<i>Melaleuca squarrosa</i> , <i>L. continentale</i> , <i>E. impressa</i> , <i>Allocasuarina paludosa</i> , <i>Xanthorrhoea</i> sp., <i>Dampiera stricta</i> , <i>S. uliginosa</i> , <i>Restio complanatus</i> , <i>Leptocarpus tenax</i>
3	dry heathland	3	<i>B. marginata</i> , <i>Xanthorrhoea</i> sp., <i>A. oxycedrus</i> , <i>L. continentale</i> , <i>E. impressa</i> , <i>B. cinerea</i>

1993. This species has since been found to be more widespread on the Isthmus (Darren Carman *pers. com.*). Populations at Mullungdung State Forest (Gilmore 1977) and Dream/Hummoek Island

(Menkhorst 1995) are apparently no longer present. The New Holland Mouse was not found at Won Wron State Forest, however, it has never been recorded from this forest. It was known from McLoughlins Beach

(Cockburn 1980; Menkhorst 1995); however, recent surveys at McLoughlins Beach failed to locate it (Fauna Survey Group, Field Naturalists Club of Victoria and Deakin University records). It was not detected at Gellions Run (Lumsden and Schultz 1985), nor was it found on Sunday Island (Myroniuk *et al.* 1993).

Possible reasons for the decline of New Holland Mouse populations in the survey areas together with future management prescriptions are discussed in the follow-up paper (part 2) (Quin and Williamson *in press*). The nearest known extant populations of New Holland Mouse to those of Wilsons Promontory occur approximately 170 km to the north-east at the Loch Sport and Providence Ponds areas in South Gippsland. Individuals were trapped at Loch Sport in 1990 and 1992, and at Providence Ponds as recently as April 1994 (Deakin University and Mammal Survey Group of Victoria records; Seebeck *et al. in prep.*).

Other Small Mammal Species - Habitat and Distribution in South Gippsland

The Brown Antechinus inhabits a wide range of habitats (Hampton *et al.* 1982), including heath communities, as the present study found. However, it was not detected in sand dune vegetation at Dream/Hummock Island or Wilsons Promontory, possibly because of a lack of tree hollows (refuge sites) in this habitat type (*pers. obs.*).

Bush Rats likewise occupy a range of habitats; however, they reach greatest abundance in habitat with exceptionally dense understoreys (Lunney 1995). At sites sampled in Mullungdung and Dream/Hummock Island, vegetation at the ground level was in places relatively sparse, especially where species of either Tea-tree or Wattle were abundant. This may explain the low trapping rate of Bush Rats at the former area and their absence at the Island. Areas dominated by sedges and lilies on dunes at Wilsons Promontory provide suitable ground cover vegetation for them.

Swamp Rats were relatively abundant in sand dunes at Dream/Hummock Island, as they were in 1977 (Peter Menkhorst *pers. comm.*). Otherwise, this species was only caught in the wetter heaths of

Mullungdung and Wilsons Promontory. This is somewhat consistent with the findings of previous studies (Braithwaite and Gullan 1978; Braithwaite *et al.* 1978; Wilson 1991), although the sedge component of understoreys, implicated in influencing Swamp Rat distribution, was generally quite low at sites on both Dream/Hummock Island and at Mullungdung.

House Mice clearly favour vegetated sand dunes as habitat at Wilsons Promontory and Dream/Hummock Island, suggesting that vegetation on the sampled dune sites is in a state of disturbance. Geologically, Oyston (1988) considered sand dunes on the Yanakie Isthmus have stabilised since the cessation of grazing and regular burning by cattle graziers. A single House Mouse was captured in recently burnt (0.8 years after fire) heathy woodland at Won Wron State Forest.

The Eastern Pygmy-possum inhabits a variety of vegetation forms, from rainforest to coastal heath. It especially favours habitats with an abundance of hollows for refuge sites (Turner and Ward 1995). Consequently, heathy woodlands of Mullungdung (and probably Won Wron) would be suitable habitat. However, Eastern Pygmy-possums were also trapped at a rehabilitated gravel scrape in Mullungdung. This scrape was created in the 1960's and intermittently used until the late 1970's. Natural regeneration was occurring, and in the late 1980's, rehabilitation works - top soil spreading and Eucalypt planting - was conducted (Graeme Davis *pers. comm.*). An abundance of potential food shrubs, including Tea-tree, occurs in the scrape, but not Banksias. Additionally, the Eastern Pygmy-possums may be taking advantage of the fallen logs, left during the initial scrape creation, as diurnal refuge sites.

Acknowledgments

I thank Barbara Wilson (Deakin University) for advice given in directing the project. The study site selection process benefited from discussions with Barbara, Tim Buttle, Peter Menkhorst, Jim Whelan, Tony Willet, the Fauna Survey Group of the Field Naturalists Club of Victoria, and the Mammal Survey Group of Victoria. Barbara, Peter and the two groups are also thanked for permitting access to their survey records.

The following persons provided valuable field support which is acknowledged: Dale Antonysen, David Body, Tim Buttle, Steve Darby, Kath and Andrew Gosden, Darren Heil, Belinda Kee, Irma Keskinen, Les Leunig, the Luckock family, Frankie MacLennan, Joan Quin, Luan Taylor and David Knowles, Jim Whelan, Ross Williamson and Andy Wise. Special thanks must go to Neil Scanlon who assisted with all aspects of field work in Mullungdung and Won Wron State Forests. Ross Williamson assisted in supervising the project.

Joy Darby's expertise produced the maps. Catriona McPhee and Beverley Van Praagh kindly identified invertebrates. Barbara Triggs identified hair samples and components of seats. Raelene Warren also analysed some hair samples. Ed and Pat Grey, Darren Quin, Susan Taylor, Sonya Feodoroff and Robyn Watson provided valuable suggestions to improve the manuscript. Further constructive comments were provided by an anonymous referee. Toni Carroll and Tracey Fuller word processed the manuscript.

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